



Newsletter

Volume 3, Number 6
November - December 1986

Director's Note

The Institute of Ecosystem Studies' Schools Program is one of many new facets of our public education program. There are four major projects presently under way. This issue of the Newsletter includes an article on one of these, "Eco-Inquiry", designed to introduce fifth and sixth graders to skills in scientific thinking. "Eco-Logic", an after-school program, teaches ecology through activities that require students in grades 4 through 9 to apply their knowledge to real-world challenges. "Eco-Issues" is for older students: tenth graders actively explore the interface between environmental issues and ecological research. Finally, "Seasonal Ecology Programs" are offered to elementary school groups on seasonal themes such as maple sugaring.

The purpose of the Schools Program is to teach students not only scientific concepts but also ways to solve problems and make decisions. We hope that a by-product of this program will be an increased ability to deal responsibly with the complexities of this technological age.

The IES Newsletter is published by the Institute of Ecosystem Studies at the Mary Flagler Cary Arboretum. Located in Millbrook, New York, the Institute is a division of The New York Botanical Garden. All newsletter correspondence should be addressed to the Editor.

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Eco-Inquiry: Scientific Literacy for Students

Close your eyes. Picture a blank screen.

Now ... call up an image of a scientist. What does the scientist look like? Fill in as many details of this person's appearance as you can ...

Classes of 5th and 6th graders going through this exercise in their first sessions of "Eco-Inquiry" are consistently coming up with the same mental picture: a man, wild hair and eyes, white lab coat, frothing test tube. Kass Hogan, program specialist in education at the Institute of Ecosystem Studies, is the designer and teacher of Eco-Inquiry and her first task is to debunk that stereotype. In subsequent lessons, her goal is to teach scientific literacy through the process of inquiry. The eleven and twelve-year-olds grasp scientific concepts through first-hand experience and experimentation, they learn how to ask and answer questions, and they begin to understand science as a discipline.

Ms. Hogan, with a background in science education and environmental education, believes that training in scientific inquiry can help students become more confident, capable and independent thinkers. Also, she feels that teaching the scientific process through ecologic investigations will lay a foundation for students' wise decision-making on environmental matters.

She begins her 10- or 20-session units by posing a non-scientific problem, for example: After a tennis game, a 12-year-old girl notices that the pearl from her ring is missing ... how does she go about trying

to find it? While working to solve the problem, students learn to evaluate evidence and to expand their problem-solving techniques. The students then consider a simple science problem and begin to learn the specialized tactics of scientific problem solving, such as controlled experimentation.

The emerging scientists move on to an ecology research problem, dealing with their subject matter in stages. Consider the class of 5th graders that worked with a pond ecosystem during September and October. First, in the 'discovery phase', the students took a trip to a pond near their school and, in addition to collecting materials for their experiments, spent two hours becoming familiar with the environments in and around the pond.

In the second phase they dealt with specific problem solving and the question: Does pollution have an effect on the pond and the pond life in any way we can observe? As an experiment, each team of three students set up two mini-ponds: quart jars containing pond water, plants and animals. One jar was treated with a diluted high-phosphate detergent while the other remained untreated. This phase of Eco-Inquiry is aimed at creating an understanding of the processes of scientific problem solving as well as of the scientific concepts themselves. Also, the teamwork required here to complete the projects successfully points out the importance of a collaborative effort in scientific endeavors.

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Ms. Hogan spends time with each group of students as they work out their scientific methods. This team is doing an experiment alongside the nature trail at the J. V. Forrester School in Beacon, New York.

Eco-Inquiry *Continued*

At the conclusion of the program, the students apply what they have learned by presenting a scientific "seminar" in their classroom for a visiting scientist from the Institute. Dr. Alan Berkowitz, head of education, was the invited guest at the pond/pollution presentations. Then, in their last class, the students play a simulation game. In one of these games, Ms. Hogan explains that each student is the director of the Environmental Protection Agency and must review the qualifications of scientists applying for a position at the Agency. She reads details of recent research projects done by the "applicants": Dr. Janet Miner, a geologist; Dr. Olek Pacifica, a marine biologist; Dr. Betsy Swallow, an ornithologist; and Dr. Roderick Wilde, a wildlife biologist. Each EPA director, using his or her recently acquired scientific literacy, must then evaluate the applicants' scientific abilities. Students are quick to pick up on faulty methods or inappropriate conclusions within the research resumes, having recently made many of the same mistakes themselves! In a thank you note to Ms. Hogan, one fifth-grade girl described her new-found understanding of the scientific enterprise, writing "Science always has a new beginning but it never seems to end."

The Institute is correlating its school education programs with the new New York State syllabus for elementary school science. It is also aiming to provide a support service for science teachers interested in observing science education techniques, especially in ecology. The first four Eco-Inquiry programs were held in

spring 1986 at Millbrook's Alden Place Elementary School and Dutchess Day School. This fall Ms. Hogan is taking her 10-session program to three 5th grade classes at the Hagan Elementary School in Spackenkill and one at Dutchess Day School, and to 6th graders at the Poughkeepsie Middle School and at Beacon's J.V. Forrestal School.

She is also doing a 20-session program for a 6th grade class at Dutchess Day School, building additional science skills over the longer period. The subject matter is a pond ecosystem and the class is divided into six teams of three students each: two of the teams are doing experiments in primary productivity, two in herbivory, and two in organic matter recycling. In the final phase of the program, the teams working on the same project will submit their written reports to each other. This activity will introduce the students to yet another aspect of science, the "peer review process", in which scientists' conclusions are submitted to review by colleagues working in the same field.

In addition to the pond/pollution and pond ecosystem projects described above, the Eco-Inquiry programs to date have introduced students to plant and soil interactions, micro-climates and soil invertebrates, and the relationship between tomato plants and the tobacco hornworm. This winter Ms. Hogan and Dr. Berkowitz are designing ways to evaluate the effectiveness of the program.

* * * * *

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Now ... call up an image of a scientist



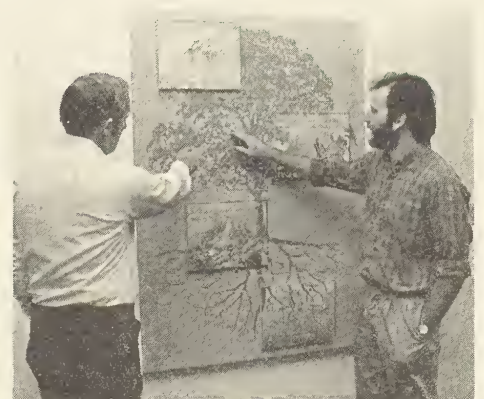
Notebooks ready, three 6th graders at the J.V. Forrestal School test the permeability of the soil.

Recent Events at IES



JILL CADWALLADER

Dutchess County Executive Lucille P. Pattison introduced the members of the Dutchess County Soil Survey Party at a news conference held at the IES Greenhouse. These U.S. Dept. of Agriculture Soil Conservation Service scientists are reviewing existing soil data for Dutchess County and preparing for remapping. Soil pits were dug near the Greenhouse and on the hillside behind, and Ms. Pattison (center, in the white skirt) and members of the press had the opportunity to learn about the soil types in this area from Roger Case (left), a soil scientist from the U.S.D.A.



JILL CADWALLADER

IES Ecology Communication Intern Collin Harty designed and completed a wall display for the reception area of the Gifford House Visitor and Education Center. The display is designed to introduce the concept of long-term ecosystem research, to point out some of the areas in which IES scientists are putting these concepts to work, and to explain the philosophy behind the Institute's public education program. Here, Mr. Harty (right) discusses the silk-screening and graphite-dust drawing techniques used in the display with IES Director Dr. Gene E. Likens.

IES Meetings and Workshops - Fall 1986

Gypsy Moth Cooperators Meeting September 24-26

IES Chemical Ecologist Clive Jones, one of a group of scientists studying the gypsy moth problem in the Northeast, recently hosted twenty-one colleagues at a meeting at the Institute's Plant Science Building. The gypsy moth research cooperators came from the U.S. Department of Agriculture Forest Service and university laboratories in Connecticut, Massachusetts, New Hampshire, New York, Pennsylvania, Vermont and West Virginia. Their agenda included presentations of current research results and future research plans, and visits to experimental plots at the Arboretum and at Harvard University's Black Rock Forest in Cornwall, N.Y.

Meeting with USSR Team for Integrated Pest Management October 29-30

Three Soviet scientists and their U.S. Department of Agriculture Forest Service hosts met with Dr. Clive Jones and Research Assistant Karen Moore to discuss the gypsy moth research done at IES and in the northeastern United States. Research methods developed by the above-mentioned cooperators are now being used in the Soviet Union, and a five-year program of U.S.-Soviet collaboration has been initiated.



From left to right: Dr. Vladimir Gnamanski (All Union Institute of Continuous Training for Managers and Specialists, and Puschkino Training and Research Institute for Practical Foresters); Dr. Harvey Smith (U.S. Department of Agriculture-Forest Service, Hamden, CT); Dr. Gene E. Likens (IES); Dr. Clive Jones (IES); Dr. William Wallner (USDA-FS, Hamden, CT); Alice Vandel (USDA-FS, Hamden, CT, and interpreter for the visit); Dr. George A. Timchenko (Kharkov Institute for Mechanization and Forest Protection); Karen Moore (IES); Dr. Noble Proctor (Southern Connecticut State University); Dr. Jacob Marchenko (Belorussian Technological Institute).

Lyme Disease Workshop October 15-16

In the course of their research on the ecology of the Lyme tick, IES Wildlife Ecologist Jay McAninch and Research Assistant Rob Hossler have worked out techniques that provide an efficient and reliable way to sample ticks on deer. They are now seeking the assistance of wildlife biologists who record physical and ecological data at deer-check stations during the fall hunt, and invited them to attend a Lyme Disease Workshop at the Institute. In this workshop, twenty-four biologists from Connecticut, Maine, New York, Pennsylvania, Virginia and Vermont as well as the province of New Brunswick had an intensive course in identifying, collecting and shipping ticks. Armed with this information at the deer-check stations, they will be able to provide the IES scientists with valuable data from inland areas that never before have been sampled for the Lyme tick or the possible presence of the Lyme Disease bacteria.

The NYBG Board of Managers Meeting October 17-18

Traditionally the fall meeting of The New York Botanical Garden's Board of Managers is held at the Institute of Ecosystem Studies. On the afternoon of October 17th, the committee that advises the Board on IES matters met to hear presentations by the Institute's research and education staff. At the full Board meeting on the following morning, agenda items included a report by Mr. Oakleigh Thorne, chairman of that IES committee, and a presentation by Dr. Gene Likens on the Hubbard Brook Ecosystem Study.

Workshop: Permanent Plot Studies of Vegetation October 23-25

Forest Ecologists Charles Canham and Steward Pickett, assisted by IES colleagues Mark McDonnell, Geoffrey Parker and Jeff Glitzenstein, brought together 15 other forest ecologists to consider ways to enhance the productivity and value of long-term studies of vegetation. The idea for this working group grew from a conference that Dr. Canham attended last March: researchers doing extended observations of forest communities realized they would benefit from better communication with others doing similar work. During the recent workshop, committees were established to write and distribute a semiannual newsletter, to prepare a directory of long-term vegetation studies, to write articles

on methods for researchers -- especially those in developing nations -- who want an update on current technology, and to plan for a major conference in 1987. Participants came to IES from 11 states ranging west to Oregon and south to Louisiana.

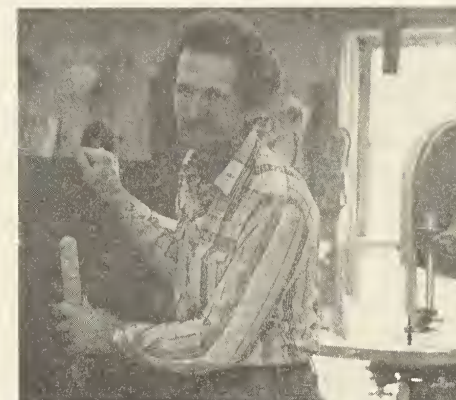
New Staff



SHARI LIFSON

MARTIN BURD, research assistant II, is working with IES Plant Ecologist Charles Canham. A graduate of the University of Wisconsin with a masters degree in botany, he worked with Dr. Canham earlier this year as a summer project assistant. Now, as a regular staff member, he is doing field and laboratory work on vegetation ecology, contributing to an investigation into how certain plant species can prevent other species from establishing themselves along power company rights-of-way.

ROBERT MULDER, assistant maintainer, has joined the operations crew under the supervision of Manager Owen Vose. He was previously employed at a local construction firm, and in his first two months at IES has assisted with office renovation and with the construction of the pergola in the Perennial Garden. Gardening -- especially the growing of bonsai trees -- is one of his outside interests.



SHARI LIFSON

IES Booklet on the Groundwater Ecosystem

Contamination of groundwater has gained national attention. Pollutants from landfills, septic systems and underground gasoline and oil tanks, as well as pesticides, are seeping through the ground. These pollutants are contaminating aquifers in many parts of the country, endangering both private and public water supplies.

The Institute of Ecosystem Studies has published a public information booklet about groundwater, with emphasis on the situation in Dutchess County. The booklet was written by Faye Rapoport as a part of the Institute's Ecology Internship Program.

Unlike many of the publications dealing with this topic, *Groundwater: An Ecological Perspective* describes groundwater as an ecosystem which includes both physical and biological components. What are these components, and what are the inputs to and the outputs from the system? How do humans affect the groundwater ecosystem, its quality and its quantity? What is being done to protect the groundwater locally? These and other questions are answered as the reader explores this hidden world.

The 12-page illustrated booklet will be mailed to all members of the Mary Flagler Cary Arboretum.

Winter Calendar

COURSES

Winter Adult Education Program courses in landscape design and gardening will begin in late January:

Landscape Design I. Site Analysis and Schematic Design
Graphics
Drawing for Plan Presentation
Naturalistic Landscaping: Enhancing Wildlife and Plant Diversity (Workshop)
Fundamentals of Gardening
Plants for Landscaping: Woody Perennials
Annuals and Perennials for Landscaping
Easy Fruits
The Residential Greenhouse
Diseases of Ornamental Plants
Organic Gardening
Flower Gardening: Wildflower, Rock and Shade Gardens

Catalogues are being mailed in December. If you are not on our mailing list and would like to receive a catalogue, call the Gifford House at the number below.

Additional courses will be offered during the spring semester, and will be announced in the next issue of the IES Newsletter.

ECOLOGICAL EXCURSIONS

For information on the following, see the Adult Education Program catalogue or call the number below:

Winter Ecology of the Bald Eagle (January 31)
A Lake in Winter: Frozen Ecology (February 7)
The New York Flower Show (March 12)
Wildlife in Winter: Bear Watch (date to be announced)
Garden in the Woods (May 27)
Cape Cod Ecology and Whale Search (June 5-7)
The Ecology of Tivoli Bay: An Exploration by Canoe (June 13)
Ecology at Black Rock Forest (June 20)

Registration deadlines are well in advance of the excursion dates, so call now!

SUNDAY ECOLOGY PROGRAMS

Public programs are offered on the first and third Sunday of each month. All programs are from one to two hours long, and begin at 2:00 pm at the

Gifford House unless otherwise noted. They are open to everyone at no cost.

Tentative schedule (please call the number below to confirm the day's topic):

January 4th - Winter encounters: A journey into the sights, smells, sounds of snow season (Kass Hogan) - W
January 18th - Discoveries in ecology (Gene Likens) - T
February 1st - Control of animal damage (Ray Winchcombe) - W/T
February 15th - Current methods in wildlife research (Jay McAninch) - T
March 1st - Stream ecology walk for the hardy (Dave Strayer) - W
March 15th - Woodlot management for small landowners (Jon Kays) - W

W: Walk - wear clothing and footwear appropriate for weather conditions

T: Talk - slide presentation and/or demonstration in the Gifford House

ARBORETUM HOURS

Monday through Saturday, 9 a.m. to 4 p.m.; Sunday, 1 - 4 p.m. The Gift and Plant Shops are open Tuesday through Saturday 11 a.m. to 4 p.m.; Sunday 1 - 4 p.m. Closed on public holidays. All visitors must obtain a free permit at the Gifford House for access to the Arboretum. Roads closed to vehicles when snow covered and during the deer hunting season.

MEMBERSHIP

Take out a membership in the Mary Flagler Cary Arboretum. Benefits include a special member's rate for IES courses and excursions, a 10% discount on purchases from the Gift Shop, six issues of the IES Newsletter each year, free subscription to *Garden* (the beautifully illustrated magazine for the enterprising and inquisitive gardener), and parking privileges and free admission to the Enid A. Haupt Conservatory at The New York Botanical Garden in the Bronx. Individual membership is \$25; family membership is \$35. For information on memberships, contact Janice Claiborne at (914) 677-5343.

Note: Your membership contribution to the Mary Flagler Cary Arboretum is eligible for the IBM Matching Grants Program for Hospitals and the Arts.

For more information, call (914) 677-5359 weekdays from 8:30 - 4:30

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